

REVISIONS																			
LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED																
B	Add vendor CAGE 27014 to case outline 2. Convert to military drawing format. Inactivate device type 01 case "C" for new design. Editorial changes throughout.	87 April 10	D. A. DiCenzo																
C	Add vendor CAGE 18324 to case outlines C, D, and 2. Editorial changes throughout.	88 Aug 23	D. A. DiCenzo																
<p>CURRENT CAGE CODE 67268</p>																			
REV																			
SHEET																			
REV																			
SHEET																			
REV STATUS OF SHEETS		REV	C	C	C	C	C	C	C	C	C	C	C						
		SHEET	1	2	3	4	5	6	7	8	9	10							
STANDARDIZED MILITARY DRAWING THIS DRAWING IS AVAILABLE FOR USE BY ALL DEPARTMENTS AND AGENCIES OF THE DEPARTMENT OF DEFENSE AMSC N/A		PREPARED BY Marcia Kelleher				DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444													
		CHECKED BY Ray Monnin																	
		APPROVED BY D. A. DiCenzo				MICROCIRCUIT, DIGITAL HEX INVERTER, HIGH-SPEED CMOS, MONOLITHIC SILICON													
		DRAWING APPROVAL DATE 1 OCTOBER 1984																	
		REVISION LEVEL C				SIZE A	CAGE CODE 14933	84098											
				SHEET 1 OF 10															

1. SCOPE

1.1 Scope. This drawing describes device requirements for class B microcircuits in accordance with 1.2.1 of MIL-STD-883, "Provisions for the use of MIL-STD-883 in conjunction with compliant non-JAN devices".

1.2 Part number. The complete part number shall be as shown in the following example:

84098	01	B	X
_____	_____	_____	_____
Drawing number	Device type (1.2.1)	Case outline (1.2.2)	Lead finish per MIL-M-38510

1.2.1 Device type. The device type shall identify the circuit function as follows:

<u>Device type</u>	<u>Generic number</u>	<u>Circuit function</u>
01	54HC04	Hex inverter

1.2.2 Case outlines. The case outlines shall be as designated in appendix C of MIL-M-38510, and as follows:

<u>Outline letter</u>	<u>Case outline</u>
B	F-3 (14-lead, .280" x .200" x .070"), flat package
C	D-1 (14-lead, .785" x .310" x .200"), dual-in-line package
D	F-2 (14-lead, .390" x .260" x .085"), flat package
2	C-2 (20-terminal, .358" x .358" x .100"), square chip carrier package

1.3 Absolute maximum ratings. 1/

Supply voltage range	-0.5 V dc to +7.0 V dc
DC input voltage	-0.5 V dc to V_{CC} +0.5 V dc
DC output voltage	-0.5 V dc to V_{CC} +0.5 V dc
Clamp diode	± 20 mA
DC output current (per pin)	± 25 mA
DC, V_{CC} or GND current (per pin)	± 50 mA
Storage temperature range	-65° C to +150° C
Maximum power dissipation (P_D)	500 mW 2/
Lead temperature (soldering, 10 seconds)	+260° C
Thermal resistance, junction-to-case (θ_{JC}):	
Cases B, C, D, and 2	See MIL-M-38510, appendix C
Junction temperature (T_J)	+175° C

1.4 Recommended operating conditions.

Supply voltage (V_{CC})	+2.0 V dc minimum to +6.0 V dc maximum
Case operating temperature range (T_C)	-55° C to +125° C
Input rise or fall time:	
$V_{CC} = 2.0$ V	0 to 1000 ns
$V_{CC} = 4.5$ V	0 to 500 ns
$V_{CC} = 6.0$ V	0 to 400 ns

1/ Unless otherwise specified, all voltages are referenced to ground.

2/ For $T_C = +100^\circ\text{C}$ to +125° C, derate linearly at 12 mW/° C.

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2. APPLICABLE DOCUMENTS

2.1 Government specification and standard. Unless otherwise specified, the following specification and standard, of the issue listed in that issue of the Department of Defense Index of Specifications and Standards specified in the solicitation, form a part of this drawing to the extent specified herein.

SPECIFICATION

MILITARY

MIL-M-38510 - Microcircuits, General Specification for.

STANDARD

MILITARY

MIL-STD-883 - Test Methods and Procedures for Microelectronics.

(Copies of the specification and standard required by manufacturers in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting activity.)

2.2 Order of precedence. In the event of a conflict between the text of this drawing and the references cited herein, the text of this drawing shall take precedence.

3. REQUIREMENTS

3.1 Item requirements. The individual item requirements shall be in accordance with 1.2.1 of MIL-STD-883, "Provisions for the use of MIL-STD-883 in conjunction with compliant non-JAN devices" and as specified herein.

3.2 Design, construction, and physical dimensions. The design, construction, and physical dimensions shall be as specified in MIL-M-38510 and herein.

3.2.1 Terminal connections. The terminal connections shall be as specified on figure 1.

3.2.2 Truth table. The truth table shall be as specified on figure 2.

3.2.3 Case outlines. The case outlines shall be in accordance with 1.2.2 herein.

3.3 Electrical performance characteristics. Unless otherwise specified, the electrical performance characteristics are as specified in table I and apply over the full case operating temperature range.

3.4 Marking. Marking shall be in accordance with MIL-STD-883 (see 3.1 herein). The part shall be marked with the part number listed in 1.2 herein. In addition, the manufacturer's part number may also be marked as listed in 6.4 herein.

3.5 Certificate of compliance. A certificate of compliance shall be required from a manufacturer in order to be listed as an approved source of supply in 6.4. The certificate of compliance submitted to DESC-ECS prior to listing as an approved source of supply shall state that the manufacturer's product meets the requirements of MIL-STD-883 (see 3.1 herein) and the requirements herein.

3.6 Certificate of conformance. A certificate of conformance as required in MIL-STD-883 (see 3.1 herein) shall be provided with each lot of microcircuits delivered to this drawing.

3.7 Notification of change. Notification of change to DESC-ECS shall be required in accordance with MIL-STD-883 (see 3.1 herein).

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TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions -55° C ≤ T _C ≤ +125° C unless otherwise specified <u>1/</u>	Group A subgroups	Limits		Unit
				Min	Max	
High-level output voltage	V _{OH}	V _{IN} = V _{IH} or V _{IL} I _O ≤ 20 μA	1, 2, 3	V _{CC} = 2.0 V	1.9	V
				V _{CC} = 4.5 V	4.4	
				V _{CC} = 6.0 V	5.9	
		V _{IN} = V _{IH} or V _{IL} I _O ≤ 4.0 mA		V _{CC} = 4.5 V	3.7	
		V _{IN} = V _{IH} or V _{IL} I _O ≤ 5.2 mA		V _{CC} = 6.0 V	5.2	
Low-level output voltage	V _{OL}	V _{IN} = V _{IH} or V _{IL} I _O ≤ 20 μA	1, 2, 3	V _{CC} = 2.0 V	0.1	V
				V _{CC} = 4.5 V	0.1	
				V _{CC} = 6.0 V	0.1	
		I _O ≤ 4.0 mA		V _{CC} = 4.5 V	0.4	
		I _O ≤ 5.2 mA		V _{CC} = 6.0 V	0.4	
High-level input voltage <u>2/</u>	V _{IH}		1, 2, 3	V _{CC} = 2.0 V	1.5	V
				V _{CC} = 4.5 V	3.15	
				V _{CC} = 6.0 V	4.2	
Low-level input voltage <u>2/</u>	V _{IL}		1, 2, 3	V _{CC} = 2.0 V	0.3	V
				V _{CC} = 4.5 V	0.9	
				V _{CC} = 6.0 V	1.2	
Input capacitance	C _{IN}	V _{IN} = 0 V T _C = +25° C, See 4.3.1c	4		10	pF
Quiescent current	I _{CC}	V _{CC} = 6.0 V V _{IN} = V _{CC} or GND	1, 2, 3		40	μA
Input leakage current	I _{IN}	V _{CC} = 6.0 V V _{IN} = V _{CC} or GND	1, 2, 3		±1	μA

See footnotes at end of table.

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TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions -55°C ≤ T _C ≤ +125°C unless otherwise specified <u>1/</u>	Group A subgroups	Limits		Unit
				Min	Max	
Functional tests		See 4.3.1d	7			
Propagation delay time; high to low, low to high <u>3/</u>	t _{PHL} , t _{PLH}	T _C = +25°C	9		100	ns
		C _L = 50 pF ±10%			20	
		See figure 3			17	
		T _C = -55°C to +125°C	10, 11		150	ns
		C _L = 50 pF ±10%			30	
		See figure 3			26	
Transition time; high to low, low to high <u>4/</u>	t _{THL} , t _{TLH}	T _C = +25°C	9		75	ns
		C _L = 50 pF ±10%			15	
		See figure 3			13	
		T _C = -55°C to +125°C	10, 11		110	ns
		C _L = 50 pF ±10%			22	
		See figure 3			19	

1/ For a power supply of 5 V ±10%, the worst case output voltages (V_{OH} and V_{OL}) occur for HC at 4.5 V. Thus, the 4.5 V values should be used when designing with this supply. Worst case V_{IH} and V_{IL} occur at V_{CC} = 5.5 V and 4.5 V, respectively. (The V_{IH} value at 5.5 V is 3.85 V.). The worst case leakage current (I_{IN} and I_{OZ}), and I_{CC} occur for CMOS at the higher voltage and so the 6.0 V values should be used. Power dissipation capacitance (C_{PD}), typically 20 pF, determines the no load dynamic power consumption, P_D = C_{PD} V_{CC} 2f + I_{CC} V_{CC}, and the no load dynamic current consumption, I_S = C_{PD} V_{CC} f + I_{CC}.

2/ Testing not required if applied as forcing function for V_{OH} or V_{OL}.

3/ Propagation delay times, when V_{CC} = 2.0 V and V_{CC} = 6.0 V shall be guaranteed if not tested to the specified parameters.

4/ Transition time (t_{THL}, t_{TLH}) if not tested shall be guaranteed to the specified limits.

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Device type 01

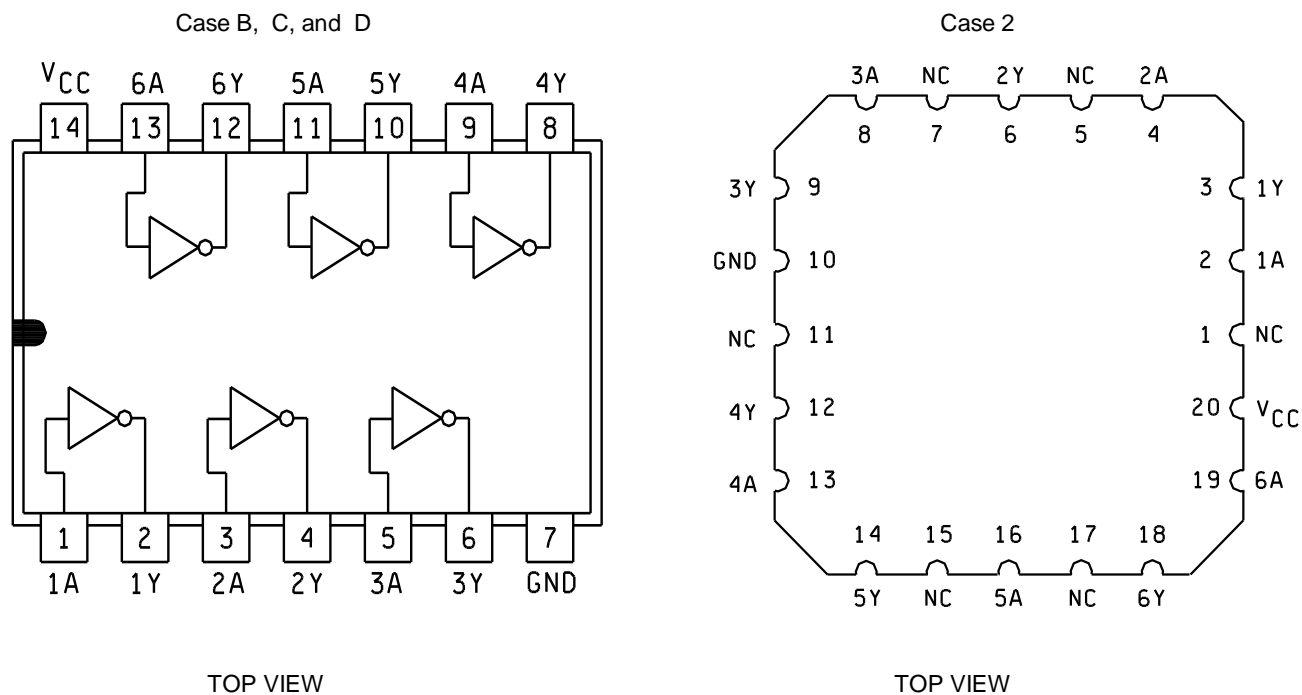


FIGURE 1. Terminal connections.

Device type 01

Truth table each gate	
Input A	Output Y
L	H
H	L

Positive logic: $Y = \bar{A}$

FIGURE 2. Truth table.

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Device type 01

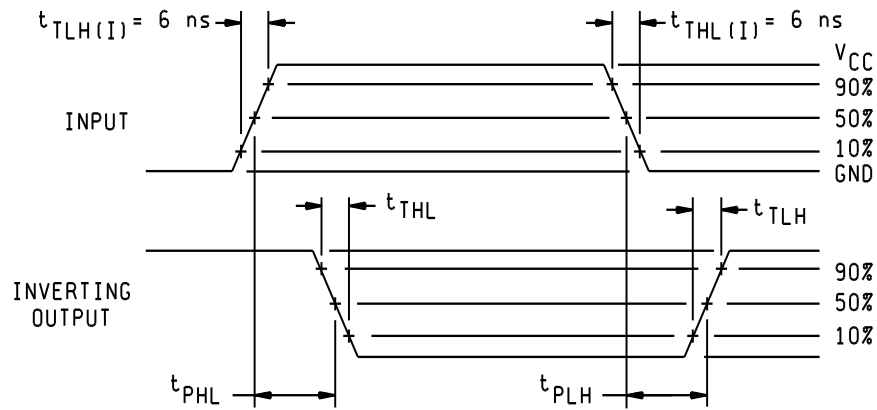


FIGURE 3. Switching waveforms.

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3.8 Verification and review. DESC, DESC's agent, and the acquiring activity retain the option to review the manufacturer's facility and applicable required documentation. Offshore documentation shall be made available onshore at the option of the reviewer.

4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling and inspection. Sampling and inspection procedures shall be in accordance with section 4 of MIL-M-38510 to the extent specified in MIL-STD-883 (see 3.1 herein).

4.2 Screening. Screening shall be in accordance with method 5004 of MIL-STD-883, and shall be conducted on all devices prior to quality conformance inspection. The following additional criteria shall apply:

- a. Burn-in test, method 1015 of MIL-STD-883.
 - (1) Test condition A, B, C or D using the circuit submitted with the certificate of compliance (see 3.5 herein).
 - (2) $T_A = +125^\circ\text{C}$, minimum.
- b. Interim and final electrical test parameters shall be as specified in table II herein, except interim electrical parameter tests prior to burn-in are optional at the discretion of the manufacturer.

4.3 Quality conformance inspection. Quality conformance inspection shall be in accordance with method 5005 of MIL-STD-883 including groups A, B, C, and D inspections. The following additional criteria shall apply.

4.3.1 Group A inspection.

- a. Tests shall be as specified in table II herein.
- b. Subgroups 5, 6, and 8 in table I, method 5005 of MIL-STD-883 shall be omitted.
- c. Subgroup 4 (C_{IN} measurement) shall be measured only for the initial test and after process or design changes which may affect input capacitance.
- d. Subgroup 7 tests shall verify the truth table specified on figure 2.

4.3.2 Groups C and D inspections.

- a. End-point electrical parameters shall be as specified in table II herein.
- b. Steady-state life test conditions, method 1005 of MIL-STD-883.
 - (1) Test condition A, B, C or D using the circuit submitted with the certificate of compliance (see 3.5 herein).
 - (2) $T_A = +125^\circ\text{C}$, minimum.
 - (3) Test duration: 1,000 hours, except as permitted by method 1005 of MIL-STD-883.

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TABLE II. Electrical test requirements.

MIL-STD-883 test requirements	Subgroups (per method 5005, table I)
Interim electrical parameters (method 5004)	---
Final electrical test parameters (method 5004)	1*, 2, 9
Group A test requirements (method 5005)	1, 2, 3, 4, 7, 9, 10, 11**
Groups C and D end-point electrical parameters (method 5005)	1, 2, 3
Additional electrical subgroups for group C periodic inspections	---

* PDA applies to subgroup 1.

** Subgroups 10 and 11, if not tested, shall be guaranteed to the specified limits in table I.

5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-M-38510.

6. NOTES

6.1 Intended use. Microcircuits conforming to this drawing are intended for use when military specifications do not exist and qualified military devices that will perform the required function are not available for OEM application. When a military specification exists and the product covered by this drawing has been qualified for listing on QPL-38510, the device specified herein will be inactivated and will not be used for new design. The QPL-38510 product shall be the preferred item for all applications.

6.2 Replaceability. Replaceability is determined as follows:

a. Microcircuits covered by this drawing will replace the same generic device covered by a contractor-prepared specification or drawing.

b. When a QPL source is established, the part numbered device specified in this drawing will be replaced by the microcircuit identified as part number M38510/65701B--.

6.3 Comments. Comments on this drawing should be directed to DESC-ECS, Dayton, Ohio 45444, or telephone 513-296-5375.

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6.4 Approved sources of supply. Approved sources of supply are listed herein. Additional sources will be added as they become available. The vendors listed herein have agreed to this drawing and a certificate of compliance (see 3.5 herein) has been submitted to DESC-ECS.

Military drawing part number	Vendor CAGE number	Vendor similar part number <u>1/</u>	Replacement military specification part number
8409801BX	01295	SNJ54HC04WA	M38510/65701BBX
8409801CX <u>2/</u>	01295 04713 27014 18324 18714	SNJ54HC04J 54HC04/BCAJC MM54HC04J/883B 54HC04/BCA CD54HC04F/3A	M38510/65701BCX
8409801DX	01295 18324	SNJ54HC04W 54HC04/BDA	M38510/65701BDX
84098012X <u>2/</u>	01295 04713 27014 18324	SNJ54HC04FK 54HC04M/B2CJC MM54HC04E/883 54HC04/B2A	M38510/65701B2X

1/ Caution. Do not use this number for item acquisition. Items acquired to this number may not satisfy the performance requirements of this drawing.

2/ Inactive for new design. Use M38510/65701BCX and M38510/65701B2X.

Vendor CAGE
number

01295

04713

18324

18714

27014

Vendor name
and address

Texas Instruments,
Incorporated
P. O. Box 6448
Midland, TX 79701

Motorola, Incorporated
7402 S. Price Rd.
Tempe, AZ 85283

Signetics Corporation
4130 South Market Court
Sacramento, CA 95834

RCA Corporation
Route 202
Somerville, NJ 08876

National Semiconductor
2900 Semiconductor Dr.
Santa Clara, CA 95051

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